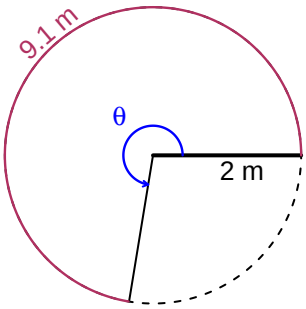
Name: Date:

Trig Final (SLTN v675)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The radius is 2 meters. The arc length is 9.1 meters. What is the angle measure in radians?

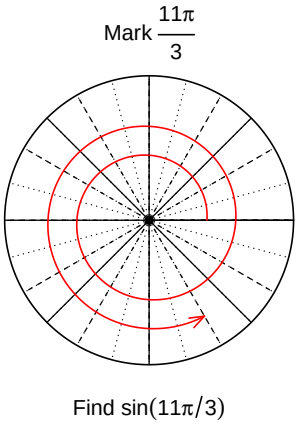


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

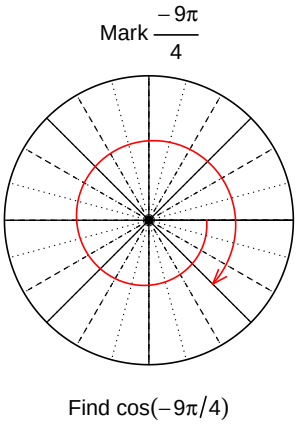
$\theta = 4.55$ radians.

Question 2

Consider angles $\frac{11\pi}{3}$ and $\frac{-9\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{11\pi}{3}\right)$ and $\cos\left(\frac{-9\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\sin(11\pi/3)$



Find $\cos(-9\pi/4)$

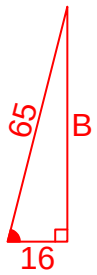
$\sin(11\pi/3) = \frac{-\sqrt{3}}{2}$

$\cos(-9\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\cos(\theta) = \frac{-16}{65}$, and θ is in quadrant II, determine an exact value for $\tan(\theta)$.

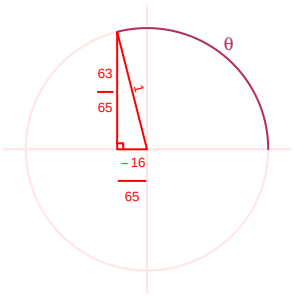
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$16^2 + B^2 = 65^2$$
$$B = \sqrt{65^2 - 16^2}$$
$$B = 63$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\tan(\theta) = \frac{\frac{63}{65}}{\frac{-16}{65}} = \frac{-63}{16}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -8.89$ meters, an amplitude of 4.02 meters, and a frequency of 5.3 Hz. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -4.02\sin(2\pi 5.3t) - 8.89$$

or

$$y = -4.02\sin(10.6\pi t) - 8.89$$

or

$$y = -4.02\sin(33.3t) - 8.89$$